Amendments to the Specification

Please delete the section entitle "CROSS-REFERENCE TO RELATED APPLICATION", including paragraph [0001].

Please amend paragraph [0005] as follows:

~~Copending and commonly assigned U.S. patent application No. 09/567,638, entitled "Integrated Digital Pixel Sensor Having a Sensing Area and a Digital Memory Area" of David Yang et al., describes an~~ An integrated DPS sensor ~~with~~ may include an on-chip memory for storing at least one frame of pixel data. The incorporation of an on-chip memory in a DPS sensor alleviates the data transmission bottleneck problem associated with the use of an off-chip memory for storage of the pixel data. In particular, the integration of a memory with a DPS sensor makes feasible the use of multiple sampling for improving the quality of the captured images. Multiple sampling is a technique capable of achieving a wide dynamic range without many of the disadvantages associated with other dynamic range enhancement techniques, such as degradation in signal-to-noise ratio and increased implementation complexity. ~~Copending and commonly assigned U.S. patent application No. 09/567,786, entitled "Multiple Sampling via a Time-indexed Method to Achieve Wide Dynamic Ranges" of David Yang et al., describes a method for facilitating image multiple sampling using a time-indexed approach.~~ The aforementioned patent and patent applications are incorporated herein by reference in their entireties.

Please amend paragraph [0006] as follows:

Figure 1 ~~duplicates Figure 3 of the aforementioned '786 patent application and~~ shows a functional block diagram of an image sensor 300. The operation of image sensor 300 using multiple sampling is described as follows~~in detail in the '786 patent application~~. Image sensor 300 includes a DPS sensor array 302 which has an N by M array of pixel elements. Sensor array 302 is similar to the digital pixel sensor described in the '425 patent and incorporates pixel level analog-to-digital conversion. A sense amplifier and latch circuit 304 is coupled to sensor array 302 to facilitate the readout of digital signals from sensor array 302. The digital signals (also referred to as digital pixel data) are stored in digital pixel data memory 310. To support multiple sampling, image sensor 300 also includes a threshold memory 306 and a time index memory 308 coupled to sensor array 302. Threshold memory 306 stores information of each pixel indicating whether the light intensity value measured by

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each pixel in sensor array 302 has passed a predetermined threshold level. In this example, the information is stored as a one-bit threshold indicator bit. The exposure time indicating when the light intensity measured by each pixel has passed the threshold level is stored in time index memory 308. In this example, the time index value is a two-bit value identifying each time exposure. As a result of this memory configuration, each pixel element in sensor array 302 can be individually time-stamped by threshold memory 306 and time index memory 308 and stored in digital pixel data memory 310.

Please amend paragraph [0013] as follows:

Figure 1 is a functional block diagram of an image sensor ~~as described in U.S. patent application 09/567,786~~.

Please amend paragraph [0026] as follows:

As described above, Figure 1 illustrates the memory configuration ~~shown in the '786 patent application~~ for facilitating multiple sampling in image sensor 300. Image sensor 300 includes threshold memory 306, time index memory 308 and digital pixel data memory 310. In image sensor 300, separate memory blocks or separate locations in a memory array are provided to store the threshold indicator information, the time index values and the digital pixel data. In the example given above where DPS array 302 outputs pixel data in 10 bits, threshold data and time index values are stored in 1 bit and 2 bits, respectively, 13 bits are used to store all of the image information for each pixel element in DPS sensor array 302. Therefore, in the configuration of image sensor 302, a memory size of N by M by 13 is required to store one frame of image data and to support multiple sampling operations. For example, when DPS array 302 has 1024 by 1024 pixel elements, the on-chip memory is at least 13 megabits. The image storage method of the present invention employs innovative image information storage schemes to reduce the amount of memory needed to store all of the image information for facilitating multiple sampling operations in a DPS sensor array. In the following description, the digital pixel data, the threshold indicator information and the time index values generated in an image sensor during the multiple sampling operations are collectively referred to as "image information."

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Please amend paragraph [0033] as follows:

Referring to the 11-bit image information embodiment in Figure 6, data memory 410 includes ~~memory cells~~ memory cells 460 and 462 in each of rows 424 to 430 designated to

store a 2-bit time index value. Memory cells 464 are designated to store 9 bits of pixel data. The 2-bit time index value stored in cells 460 and 462 also includes encoded threshold indicator information. In the present embodiment, the threshold indicator information is encoded in the first bit of the two-bit time index value, that is, cell 460. Of course, in other embodiments where the time index value is stored in more than 2 bits, the threshold indicator information may be encoded in one or more bits of the time index value. According to the present embodiment, in the "all-other exposure cases," data memory 410 stores the time index values in two bits and the pixel data in 9 bits. The term "all-other exposure cases" is used to refer to situations where the pixel intensity value of a pixel element exceeds the predetermined threshold level at any one of the exposure times before the last exposure time. In those cases, it is necessary to retain the time index values as well as the pixel data so that the pixel data for the pixel element can be normalized later on to provide a resultant pixel data value.

Please amend the section entitled "ABSTRACT OF THE DISCLOSURE" as follows:

A method for storing image information in a digital pixel sensor is disclosed for reducing the size of the memory needed to facilitate multiple sampling. An image sensor includes a sensor array of pixel elements generating pixel data in k bits and a data memory for storing pixel data of each pixel ~~elements~~ element. In one embodiment, the data memory in the digital pixel sensor stores an m-bit time index value and the lower k-1 bits of the pixel data for pixel data exceeding the predetermined threshold level in all exposure times except the last. When pixel data in the last exposure time is captured, the data memory stores the time index value in less than m bits and stores the k-bit pixel data. The size of the data memory is minimized while preserving the image quality. The method of the present invention provides the benefits of reducing manufacturing cost and improving production yield.

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